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NEC

User's Manual

RX77016

Real-Time Operating System

Configuration Tool

Target Device

μPD77016
μPD77017
μPD77018
μPD77018A
μPD77019
μPD77110
μPD77111
μPD77112
μPD77113
μPD77114

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INTRODUCTION

Target Readers

This manual is intended for users who wish to understand the functions of the μPD77016 Family and to design and develop application programs using these microcontrollers.

μPD77016 Family is the generic name for the μPD77016, 77017, 77018, 77018A, 77019, 77110, 77111, 77112, 77113, and 77114.
In this manual, the μPD77016 is described as a typical device unless there are specific differences with respect to functions.

Purpose

This manual is intended for users to understand how to use the RX77016 real-time operating system configuration tool.

Organization

This user's manual consists of the following contents.

- About the RX77016 Configuration Tool
- The User Interface
- Menu Commands
- RX77016 Configuration Tool Functions

How to Use This Manual

It is assumed that the reader of this manual has general knowledge in the fields of logical circuits and microcontrollers and basic knowledge of Windows™ operating methods.

This manual mentions some functions that are not available in the present version. In addition, the keywords "task" and "sub task" are used, but these are not equivalent in meaning to application programs. "Sub task" designates the smallest unit the OS manages and "task" designates a unit by which a number of sub tasks are managed collectively.

Conventions

Data significance:	Higher digits on the left and lower digits on the right
Active low representation:	$\overline{\times\times\times}$ (overscore over pin or signal name)
Note:	Footnote for item marked with Note in the text
Caution:	Information requiring particular attention
Remark:	Supplementary information
Numerical representation:	Binary ···×××× or 0b××××
	Decimal ···××××
	Hexadecimal ··· 0x××××

Related Documents The related documents indicated in this publication may include preliminary versions. However, preliminary versions are not marked as such.

- Documents related to the μPD77016 Family

Document Name / Part Number	Pamphlet	Data Sheet	User's Manual		Application Note
			Architecture	Instruction	Basic Software
μPD77016	U12395E	U10891E	U10503E	U13116E	U11958E
μPD77017		U10902E			
μPD77018					
μPD77018A		U11849E			
μPD77019					
μPD77019-013		U13053E			
μPD77110		U12801E	To be prepared		
μPD77111					
μPD77112					
μPD77113		U14373E			
μPD77114					

- Documents related to development tool

Document Name		Document No.
IE-77016-98/PC User's Manual	Hardware	EEU-1541
IE77016-CM-LC User's Manual		U14139E
RX77016 User's Manual	Functions	U14397E
	Configuration Tool	This manual
RX77016 Application Note	HOST API	U14371E

Caution The related documents listed above are subject to change without notice. Be sure to use the latest version of each document for designing.

CONTENTS

CHAPTER 1 ABOUT THE RX77016 CONFIGURATION TOOL 13
1.1 Overview of the RX77016 Configuration Tool 13

CHAPTER 2 USER INTERFACE 15
2.1 Main Window 15
2.2 Toolbar 16
2.3 Status Bar 17

CHAPTER 3 MENU COMMANDS 19
3.1 [File] Menu 19
3.2 [Edit] Menu 20
3.3 [View] Menu 21
3.4 [Help] Menu 22

CHAPTER 4 RX77016 CONFIGURATION TOOL FUNCTIONS 23
4.1 File 23
4.1.1 Creating new task information 23
4.1.2 Saving task information 23
4.1.3 Reading task information 23
4.1.4 Generating Configuration Files 23
4.2 Edit 24
4.2.1 Editing 24
4.2.2 Adding and deleting 24
4.2.3 Moving tasks and sub tasks 24
4.3 Display 25
4.3.1 Main window 25
4.3.2 Changing the screen split position 26
4.3.3 Tree and list 27
4.3.4 One Point window 29
4.3.5 About window 29
4.4 Setting Properties 30
4.4.1 Setting General RTOS property 30
4.4.2 Setting Task information property 31
4.4.3 Setting Interrupt handler property 33
4.4.4 Setting Other property 35
4.4.5 Setting Memory property 37
4.4.6 Setting Task property 38
4.4.7 Setting Sub task property 39
4.5 Setting Properties of Optional Functions 41
4.5.1 Setting Event task property 41
4.5.2 Setting Host API property 42

LIST OF FIGURES

Figure No.	Title	Page
1-1	Overview of RX77016 Configuration Tool	13
2-1	Main Window Screen	15
3-1	[File] Menu Selection Screen	19
3-2	[Edit] Menu Selection Screen	20
3-3	[View] Menu Selection Screen	21
3-4	[Help] Menu Selection Screen	22
4-1	Main Window Screen	25
4-2	Changing the Screen Split Position	26
4-3	One Point Window Screen	29
4-4	About Window Screen	29
4-5	General RTOS property Setting Screen	30
4-6	Task information property Setting Screen	31
4-7	Interrupt Settings	31
4-8	Interrupt handler property Setting Screen	33
4-9	Other property Setting Screen	35
4-10	Memory property Setting Screen	37
4-11	Task property Setting Screen	38
4-12	Sub task property Setting Screen	39
4-13	Event task property Setting Screen	41
4-14	Host API property Setting Screen	42
4-15	Host API property Setting Screen (Using Byte Access Method)	43

LIST OF TABLES

Table No.	Title	Page
3-1	List of [File] Menu Commands	19
3-2	List of [Edit] Menu Commands	20
3-3	List of [View] Menu Commands	21
3-4	List of [Help] Menu Commands	22

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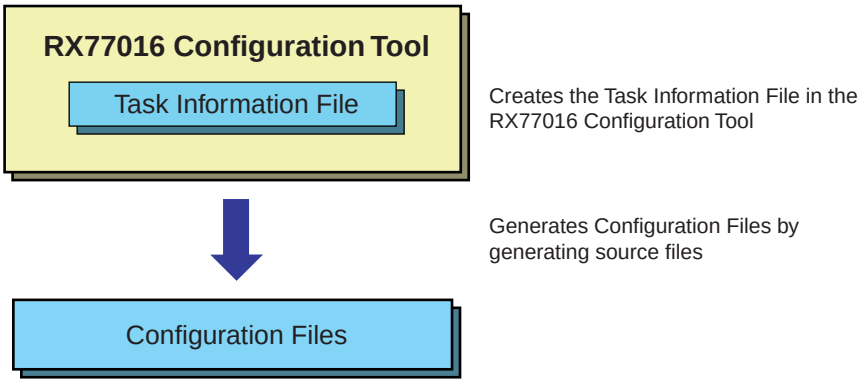
CHAPTER 1 ABOUT THE RX77016 CONFIGURATION TOOL

1.1 Overview of the RX77016 Configuration Tool

In order to link a task to an RX77016, a user must create a number of interface source programs. The configuration tool performs automatic generation of the files needed for linking to the RX77016 core according to parameters specified by the user. Since the configuration tool is designed based on a GUI, the user can create files easily.

Figure 1-1. Overview of RX77016 Configuration Tool


RX77016 Configuration Tool
Task Information File
Creates the Task Information File in the RX77016 Configuration Tool
Generates Configuration Files by generating source files
Configuration Files

The configuration tool consists of the execution file MOSConf.exe and four files (OS_idata.mos, OS_taskx.mos, OS_udef.mos, definf0.mos) known as MOS files.

The files generated by the configuration tool are called configuration files and this applies to the following files.

(1) OS_UDEF.H

This file is used to generate configuration settings. RX77016 operation is set up to suit the system in use.

(2) OS_IDATA.ASM

Task parameters used in sub task scheduling are set in this file.

(3) OS_TASKX.ASM

All sub tasks used by the RX77016 are registered in this file.

(4) devinf0.ini

Information needed in the Host API is set in this file. The Host API reads this information.

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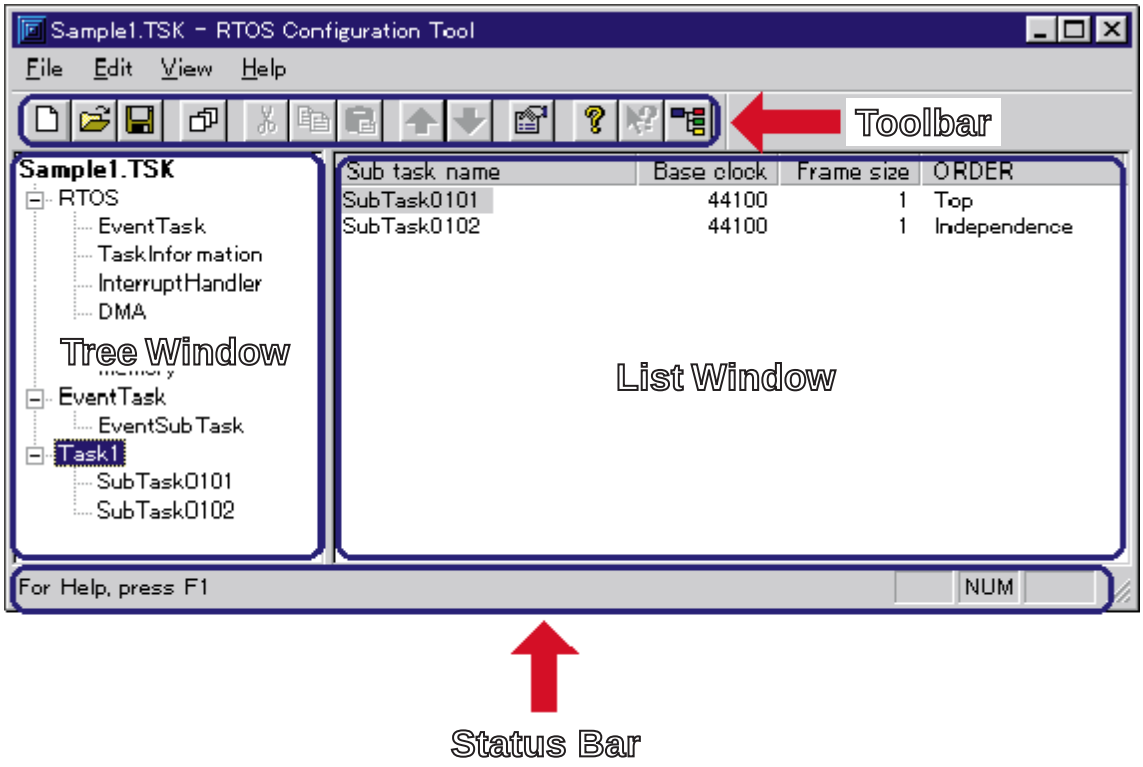
2.1 Main Window

The following figure shows the main window of the RX77016 Configuration Tool. It also shows the names by which each part is known.

Figure 2-1. Main Window Screen



2.2 Toolbar

By using the toolbar, you can shorten the invocation of menus that are used frequently in the Configuration Tool. The function of each command in the toolbar is shown below.

Opens the General RTOS property to create a new Task Information File.

Opens a dialog box to load an existing Task Information File.

Updates and saves the Task Information File being worked on.

Generates Configuration Files and output the files to the same folder as that containing the Task Information File.

This function is not available in the present version.

This function is not available in the present version.

This function is not available in the present version.

Moves the selected task or sub task up.

Moves the selected task or sub task down.

Opens the property window of the item selected by the cursor.

Displays version information for the RX77016 Configuration Tool.

This function is not available in the present version.

Generates a sub task for the selected task and opens the property window.

2.3 Status Bar

The information about each command can be viewed by clicking a menu item or the toolbar. The status bar also displays information related to the current task (see the figure in **2.1 Main Window**).

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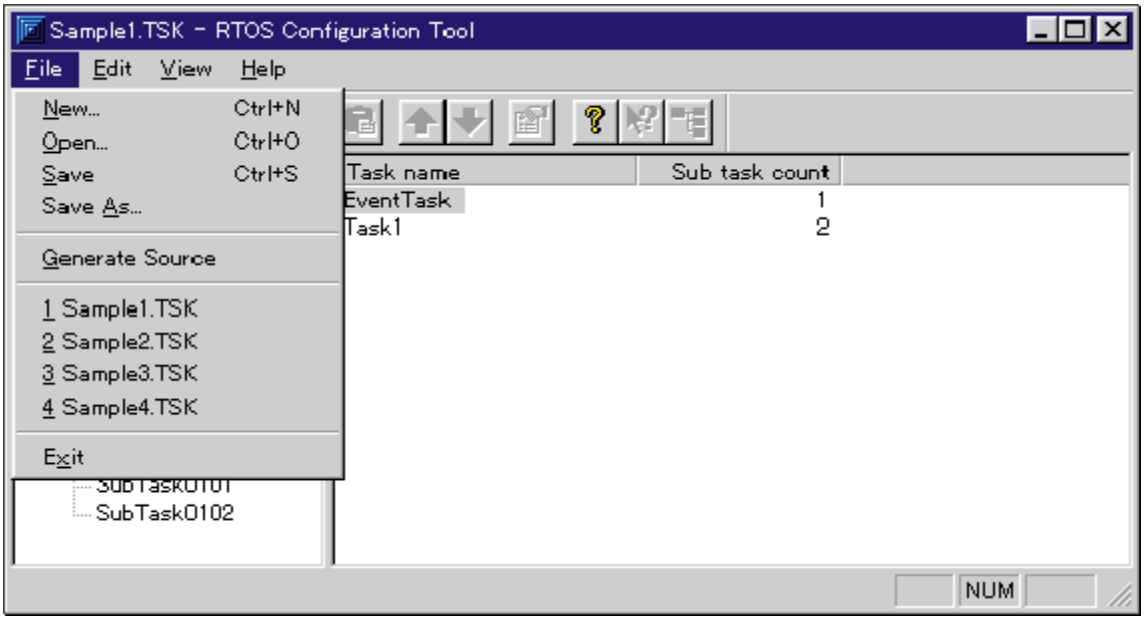
CHAPTER 3 MENU COMMANDS

3.1 [File] Menu

Selecting the [File] menu displays the menu commands shown below.

Figure 3-1. [File] Menu Selection Screen



The following table shows each [File] menu command.

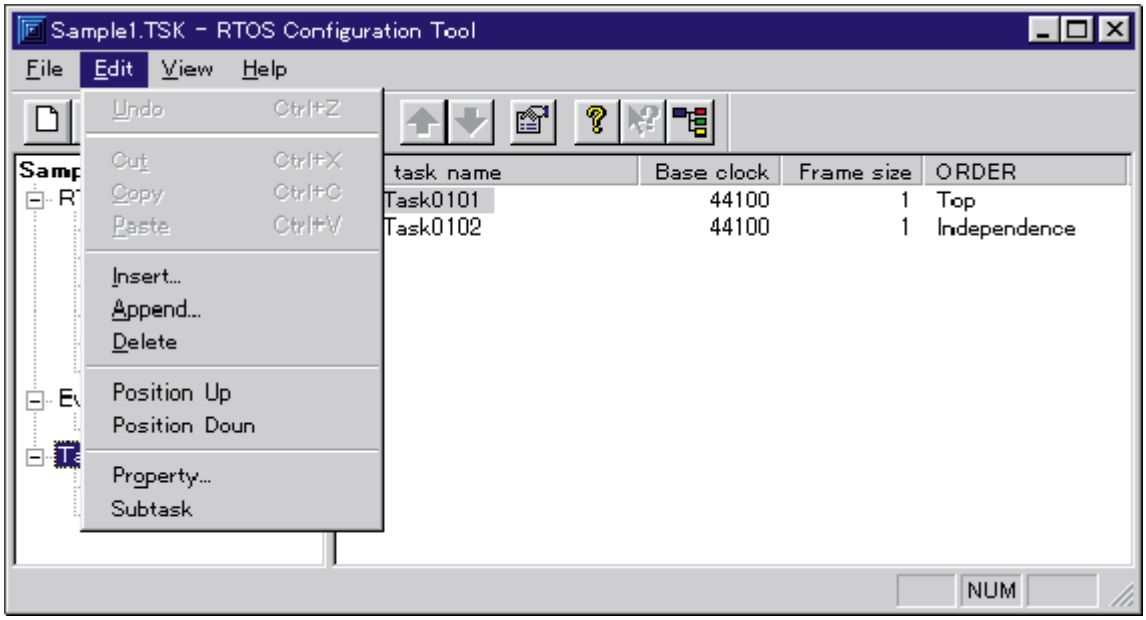
Table 3-1. List of [File] Menu Commands

Command	Function
New ... (Ctrl+N)	Opens the General RTOS property to generate a new Task Information File.
Open ... (Ctrl+O)	Opens a dialog box to load an existing Task Information File.
Save (Ctrl+S)	Updates and saves the Task Information File being worked on.
Save As ...	Saves the working Task Information File under a different name.
Generate Source	Generates Configuration Files and output the files to the same folder as that containing the Task Information File.
Recent File	Up to four Task Information Files used in the past are displayed starting from the most recent. A previous Task Information File can be opened from here.
Exit	Terminates the RX77016 Configuration Tool.

3.2 [Edit] Menu

Selecting the [Edit] menu displays the menu commands shown below.

Figure 3-2. [Edit] Menu Selection Screen



The following table shows each [Edit] menu command.

Table 3-2. List of [Edit] Menu Commands

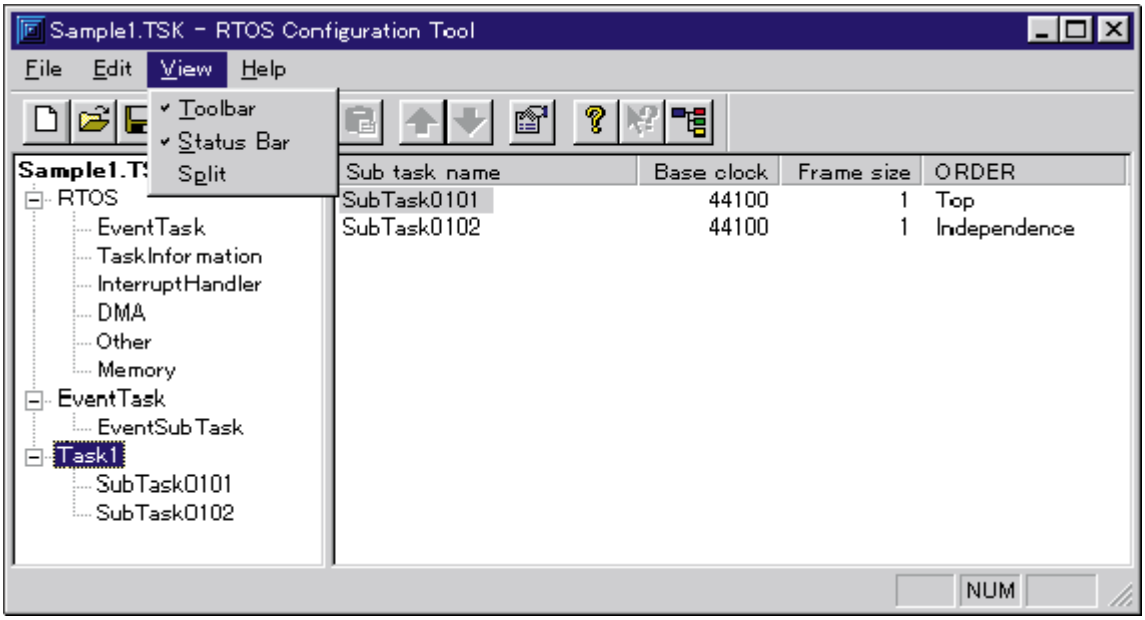
Command	Function
Undo (Ctrl+Z)	Reverts to the status before the current operation[Note].
Cut (Ctrl+X)	Deletes the selected task or sub task and send it to the clipboard[Note].
Copy (Ctrl+C)	Sends the selected task or sub task to the clipboard[Note].
Paste (Ctrl+V)	Inserts the task or sub task from the clipboard immediately after the selected position[Note].
Insert ...	Inserts a task or sub task immediately before the selected position.
Append ...	Adds a task or sub task immediately after the selected position.
Delete	Deletes the selected task or sub task.
Position Up	Moves the selected task or sub task up.
Position Down	Moves the selected task or sub task down.
Property ...	Opens the property window of the item selected by the cursor.
Sub task	Generates a sub task for the selected task and opens the property window.

Note This function is not available in the present version.

3.3 [View] Menu

Selecting the [View] menu displays the menu commands shown below.

Figure 3-3. [View] Menu Selection Screen



The following table shows each [View] menu command.

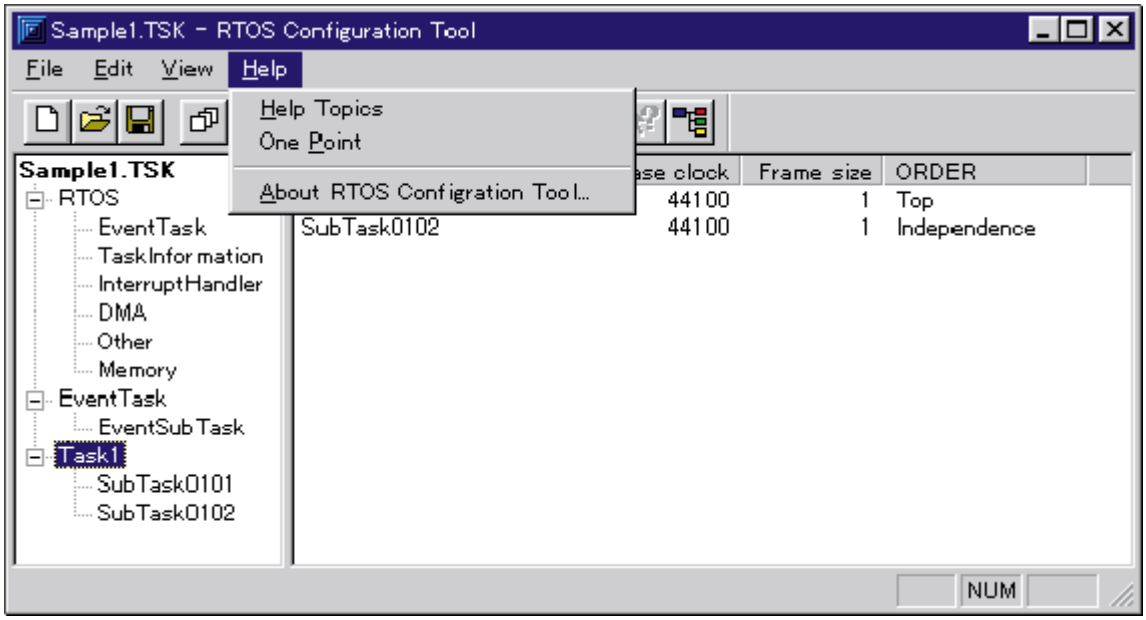
Table 3-3. List of [View] Menu Commands

Command	Function
Toolbar	Displays or hides the toolbar.
Status Bar	Displays or hides the status bar.
Split	Changes the screen split position.

3.4 [Help] Menu

Selecting the [Help] menu displays the menu commands shown below.

Figure 3-4. [Help] Menu Selection Screen



The following table shows each [Help] menu command.

Table 3-4. List of [Help] Menu Commands

Command	Function
Help Topics	Displays the online help file.
One Point	Displays the One Point window. If the check at the lower left is removed, this is not displayed beginning with the next startup.
About RTOS Configuration Tool ...	Displays the copyright and version of the program.

CHAPTER 4 RX77016 CONFIGURATION TOOL FUNCTIONS

4.1 File

4.1.1 Creating new task information

To create a new Task Information File, click [New …] on the [File] menu. Alternatively, input [Ctrl+N] from the keyboard, or use the toolbar shortcut button. At this time, the RX77016 Configuration Tool opens the General RTOS property window and requests that each parameter be set.

4.1.2 Saving task information

Saves task information during or after its creation. To save a newly created Task Information File or change the name of the created file, click [Save As …] on the [File] menu. Click [Save] on the [File] menu to save a task information file that is being used without changing its name.

4.1.3 Reading task information

To read a Task Information File that has been saved, click [Open …] on the [File] menu. Alternatively, input [Ctrl+O] from the keyboard, or use the toolbar shortcut button. At this time, the RX77016 Configuration Tool opens a dialog box containing the Task Information Files being used. The file to be opened also can be dragged and dropped from the explorer. To open task information that you worked on previously, click the file name displayed at the bottom of the [File] menu. The RX77016 Configuration Tool displays up to four past files starting from the file that was last used.

4.1.4 Generating Configuration Files

In order to create Configuration Files, click [Generate Source] on the [File] menu. Alternatively, input [Ctrl+G] from the keyboard, or use the shortcut button in the toolbar. Configuration Files cannot be generated for a task in the RX77016 Configuration Tool unless it has at least one sub task.

4.2 Edit

4.2.1 Editing

The editing functions [Undo], [Cut], [Copy], and [Paste] are not available in the present version.

4.2.2 Adding and deleting

A new file can be added or a file deleted in the task or sub task that is being edited. The number of tasks that can be appended or inserted is 31 if using the high priority event task management function, and 32 if not using it. Moreover, if using the low priority event task function, the number of sub tasks that can be appended or inserted is 30 for Task1. For each task other than this one, the number of sub tasks is 31. Normally, deletion of tasks and sub tasks is not restricted, but Task1 and Event Task cannot be deleted.

The functions described above correspond to the [Insert …], [Append …], and [Delete] commands of the [Edit] menu.

4.2.3 Moving tasks and sub tasks

The order of definition of tasks and sub tasks defined in a list can be shifted.

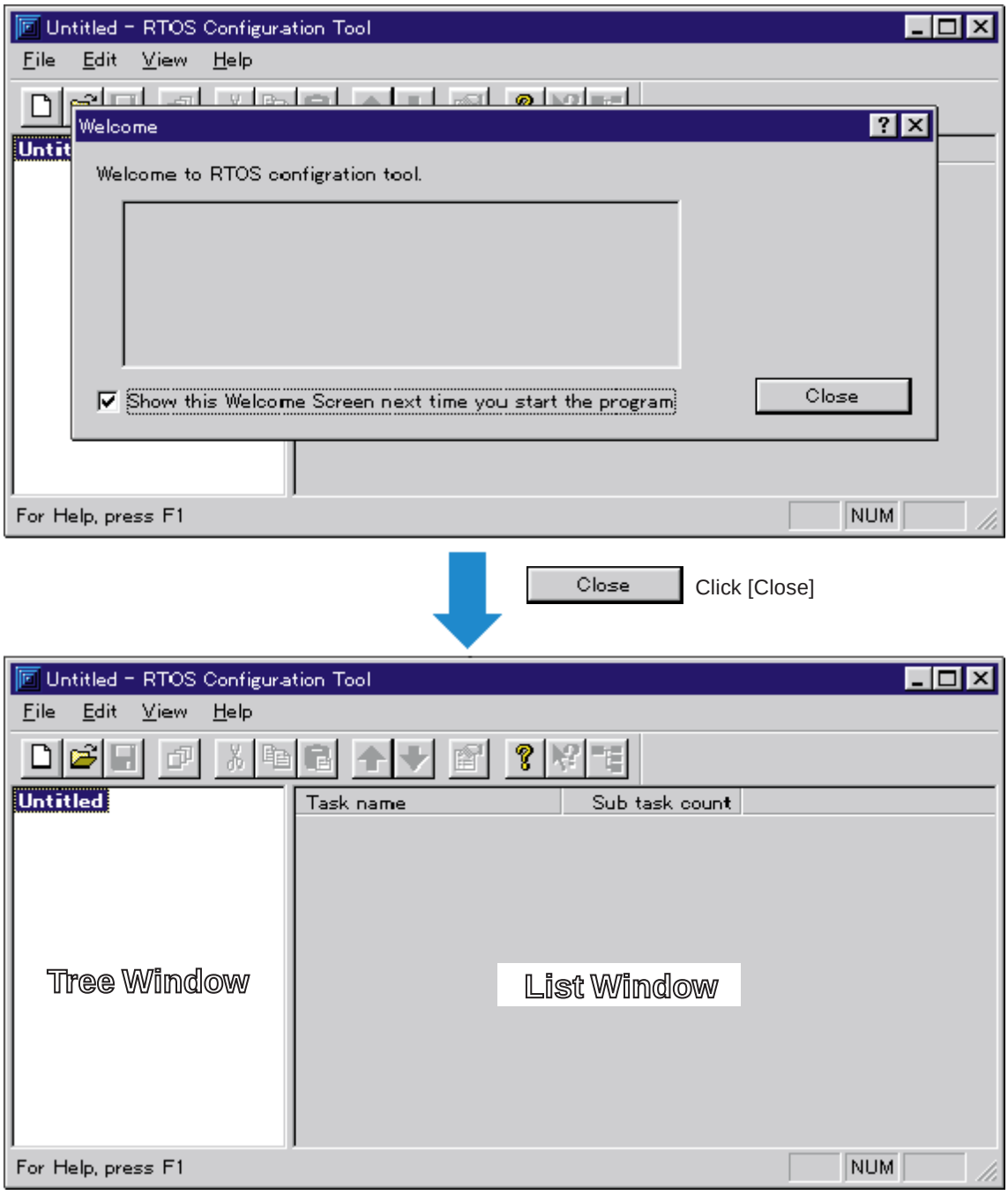
[Position Up] and [Position Down] on the [Edit] menu correspond to this. This function also can be used from the toolbar shortcut buttons.

4.3 Display

4.3.1 Main window

When you start the RX77016 Configuration Tool, the One Point window screen is displayed. Clicking on [Close] displays the main window screen.

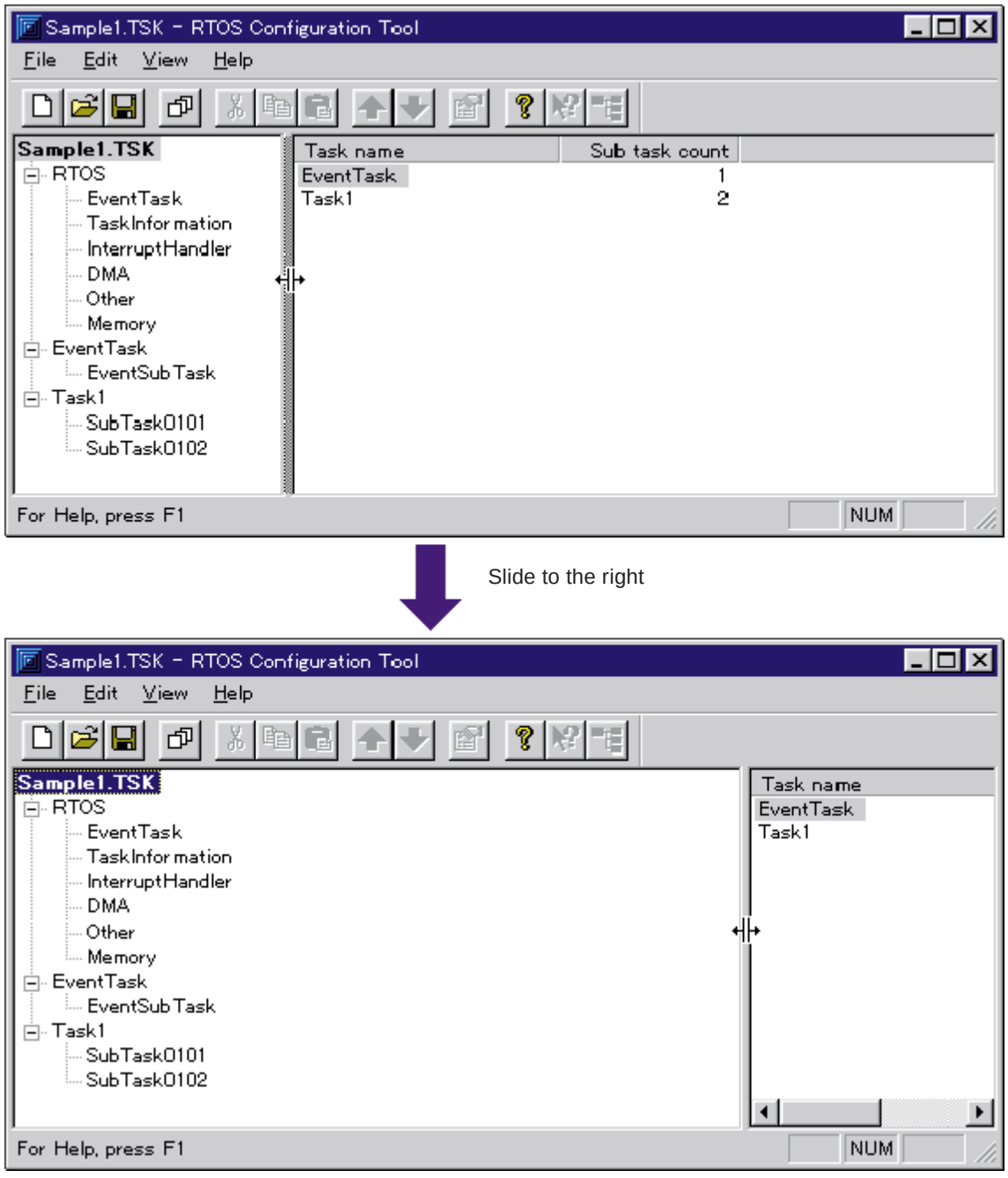
Figure 4-1. Main Window Screen



4.3.2 Changing the screen split position

The display proportion of the task tree and list in the main window can be changed.

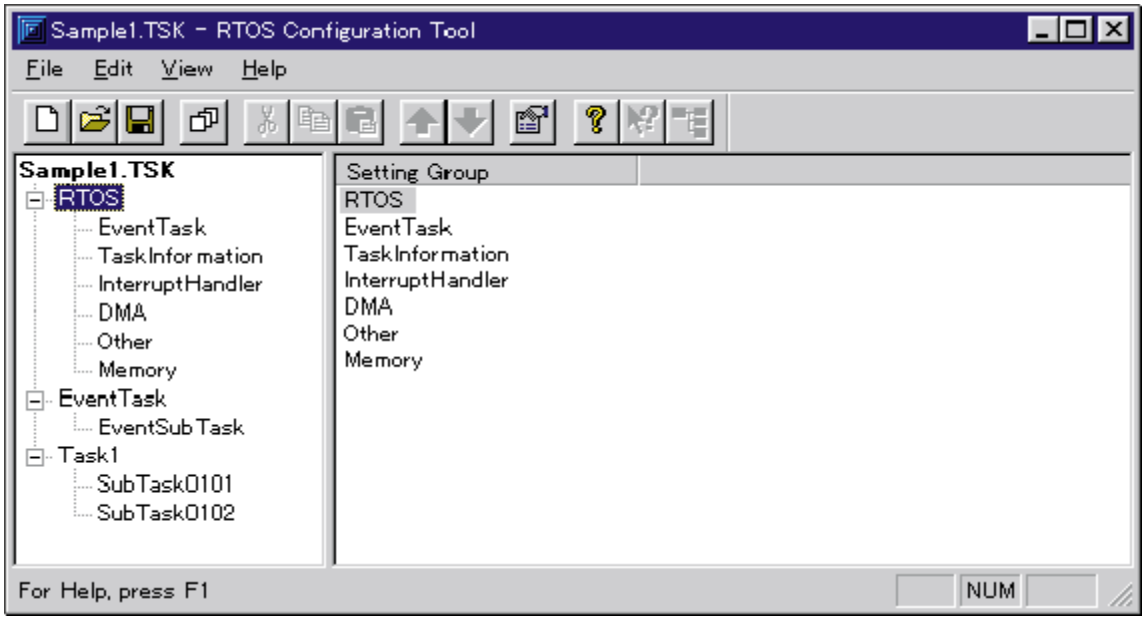
Figure 4-2. Changing the Screen Split Position



4.3.3 Tree and list

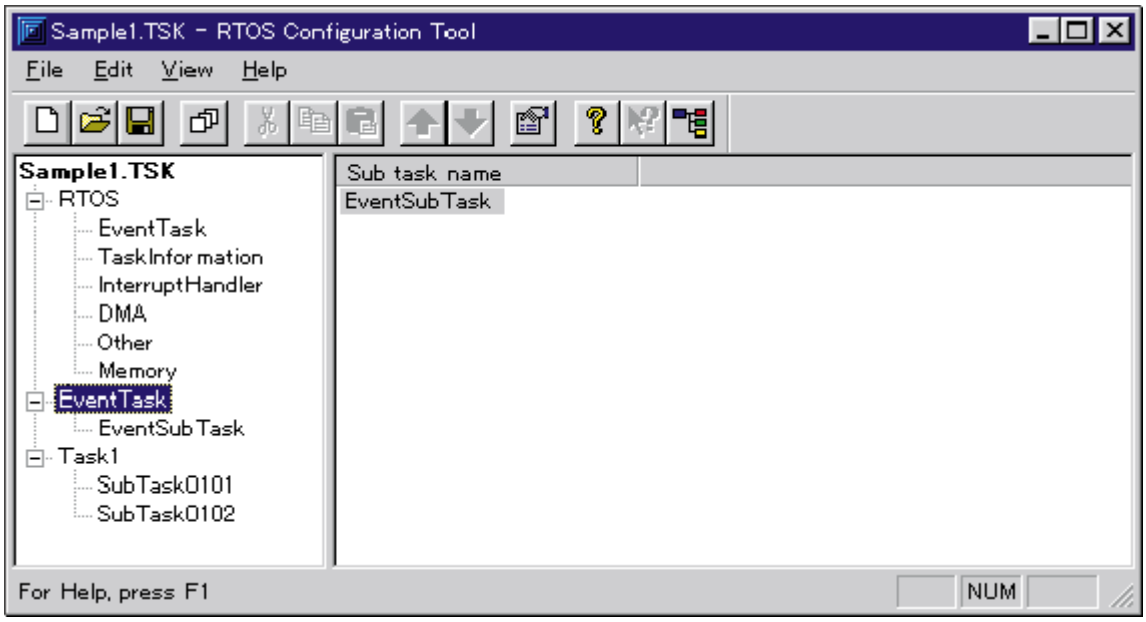
The main window of the RX77016 Configuration Tool consists of a tree structure and a list structure as its basic structure. Selecting any item in the Tree window lists that item's group in the List window.

(1) When RTOS is selected



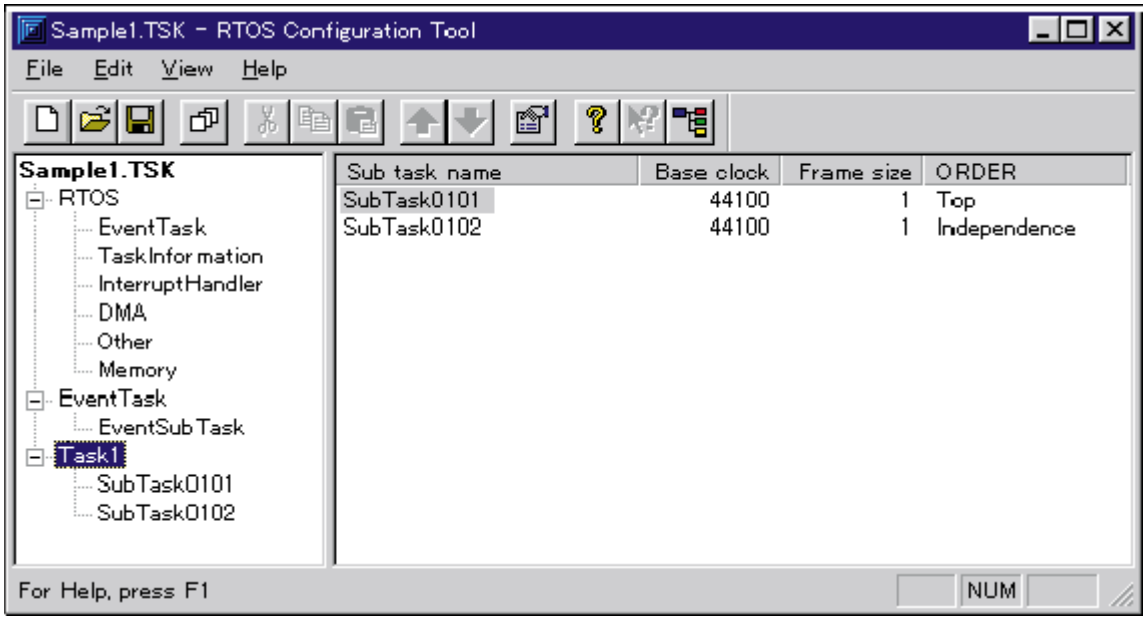
Selecting RTOS in the Tree window displays the group in the tree in list format in the List window. Moreover, the list displayed in the List window is always the same for any item in the Tree window. For example, the list displayed in the List window when [Other] is selected in the Tree window is the same as when [RTOS] is selected.

(2) When Event Task is selected



Selecting Event Task in the Tree window displays the sub tasks executed in Event Task in list format in the List window.

(3) When Task is selected

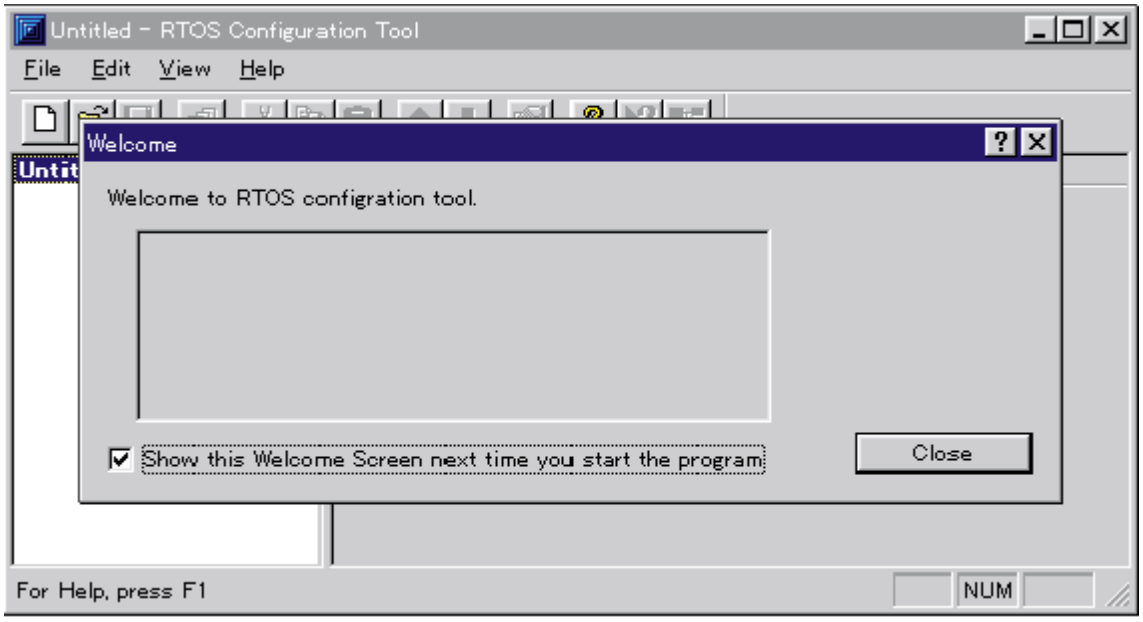


Selecting Task in the Tree window displays information about sub tasks executed in Task in list format in the List Window. Sub task name, base clock, frame size, and order information are displayed in the list.

4.3.4 One Point window

The following screen is displayed at Configuration Tool startup or by clicking on [One Point] on the [Help] menu. (In the present version, the window opens but the One Point content is not displayed.)

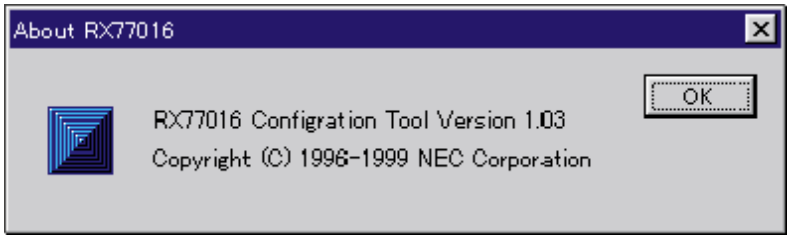
Figure 4-3. One Point Window Screen



4.3.5 About window

The About Window displays the version and copyright. It is invoked by [About RX77016 Configuration Tool …] on the [Help] menu or the toolbar shortcut.

Figure 4-4. About Window Screen



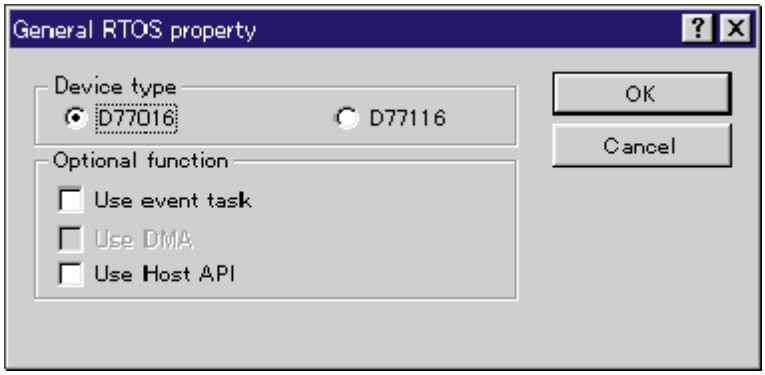
4.4 Setting Properties

The RX77016 Configuration Tool consists of a number of property windows. The user sets properties for each item to obtain the desired Configuration File. Each property window can be opened from [Property …] on the [Edit] menu. Alternatively, double-clicking tree items in the main window or a displayed item opens it. The [Edit] menu can be viewed by right-clicking on item in the list.

4.4.1 Setting General RTOS property

The following figure shows the General RTOS property setting screen.

Figure 4-5. General RTOS property Setting Screen



(1) Device type

Specify the type of device the user is using in Device type. The DMA function cannot be used in Optional function when using the μPD77016.

(2) Optional function

(a) Use event task

Select this check box when using an event task in an application program.

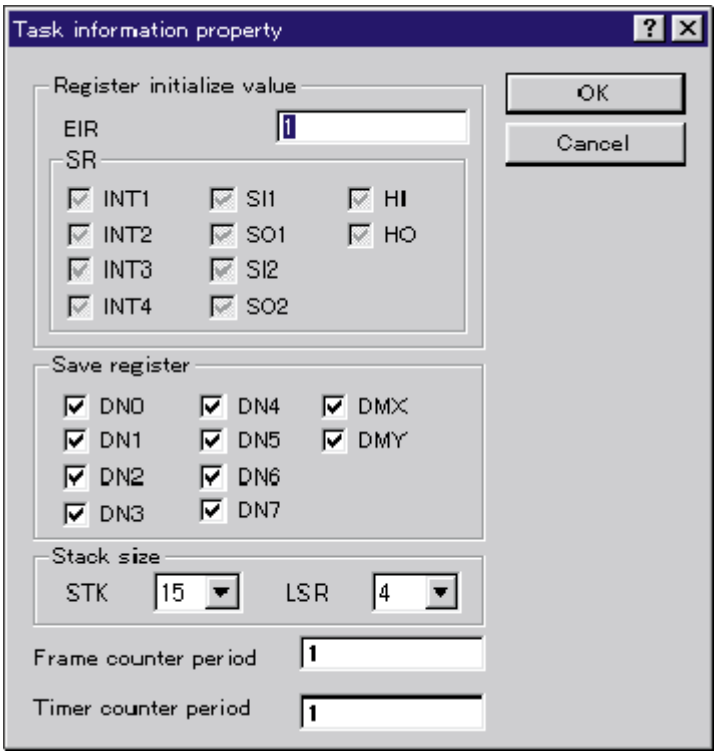
(b) Use Host API

Select this check box when using the Host API function in an application program.

4.4.2 Setting Task information property

This sets properties of task information.

Figure 4-6. Task information property Setting Screen



Each command is described below.

(1) Register initialize value

For each task, set initial values of the interrupt enable flag stack register (EIR) and status registers (SR) for when the task first starts.

The EIR is a 16-bit register. The default value of 1 means it is interrupt enabled. The specification range is from 0 to 32767.

The SR also are 16-bit registers, but they do not have default values. The user specifies disabling interrupts, enabling interrupts, or not setting interrupts.

Figure 4-7. Interrupt Settings

(2) Save register

This determines whether or not to save or recover a register when switching tasks. The default value is set so that a save or recovery is performed. A register that is not used in any application program or a register used in only one task need not be saved or recovered.

(3) Stack size

Specify the size of the CALL stack and the size of the LOOP stack. The specification range for CALL stack size is from 2 to 15, and that for LOOP stack size is from 1 to 4.

The default value of CALL stack size is 15, and that of LOOP stack size is 4.

(4) Frame counter period and Timer counter period

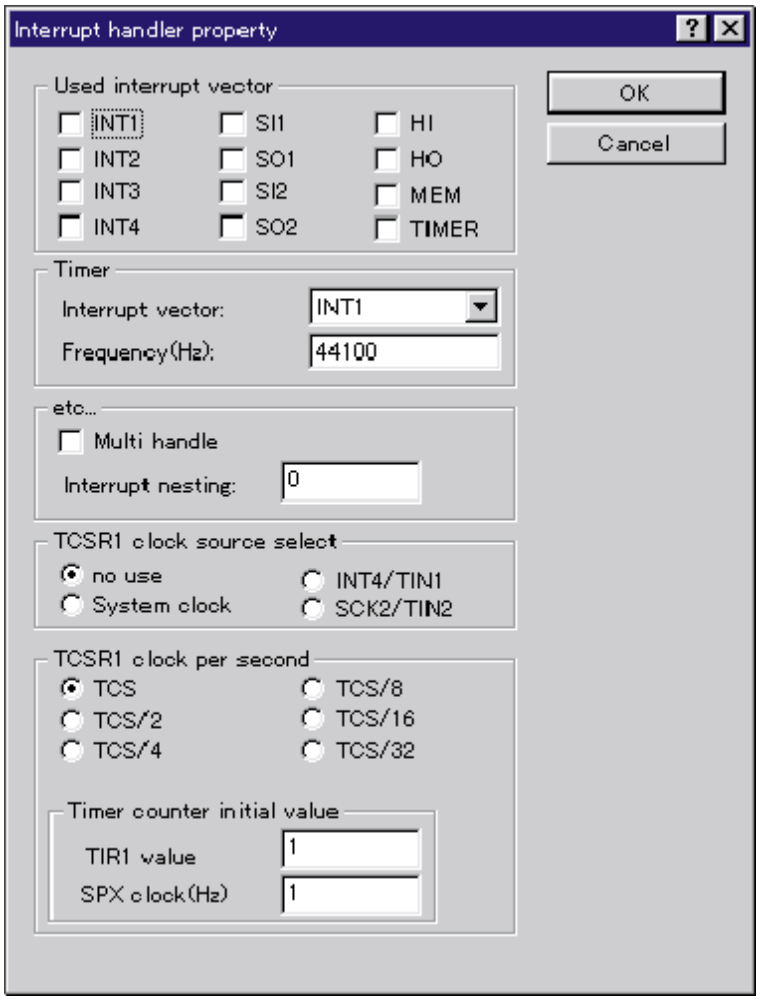
Specify the timing of updating the frame counter value (Frame counter period) and the timing of task monitoring (Timer counter period).

The larger the value of the frame counter period, the smaller the MIPS value the RX77016 uses and the larger the sub task execution interval. Moreover, the larger the value of the timer counter period, the larger the MIPS value the RX77016 uses. Neither one has a default value, so specify a value of 1 or higher.

4.4.3 Setting Interrupt handler property

This sets properties of the interrupt handler.

Figure 4-8. Interrupt handler property Setting Screen



Each command is described below.

(1) Used interrupt vector

Specify locations to use as interrupt vectors. Be sure to specify the same locations as those specified in SR in the Task information property.

(2) Timer

Specify an interrupt vector to use as a timer and the execution period of the interrupt handler to use as a timer (Frequency). There is no default value for either value.

(3) etc …

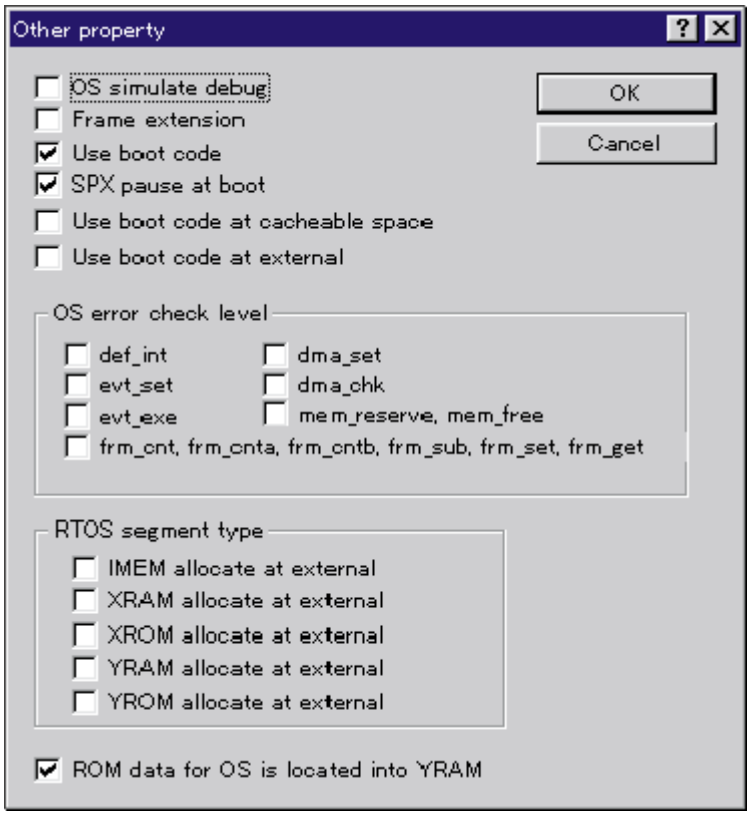
Normally, the initially defined destination of calls to interrupt handler code cannot be changed. However, the multi-handler command (Multi handle) is used when you want to switch the destination of calls to interrupt handler code to another interrupt handler from inside a task. The default value is set so that the Multi handle is not used.

If using interrupt nesting, be sure to make the nesting level specified in the property match the nesting level actually used. If the actual interrupt nesting level exceeds the specified nesting level, subsequent operation is not guaranteed.

4.4.4 Setting Other property

This sets properties of other parameters.

Figure 4-9. Other property Setting Screen



Each command is described below.

(1) OS simulate debug

Use this command to validate RX77016 operation using the software simulator (HSM77016). The default value is set so that code without simulation information is output.

(2) Frame extension

This is used to request more detailed frame information. Using this command provides the following 4 kinds of additional frame information.

(a) Sub task end frame counter

This saves the value before updating of the frame counter that is updated when a sub task terminates. It maintains the value until the next time the same sub task is executed and terminates.

(b) Frame overflow status

If the sum of the values of the sub task end frame counter and frame counter B is 0 or less, a value of 1 is set to indicate frame overflow. The initial value is 0.

(c) Maximum value of frame counter

This maintains the maximum negative value of past sub task end frame counter values.

(d) Frame overflow counter

This counts the number of times the frame overflow status was frame overflow.
The default value is set so that frame information extension is not performed.

(3) Use boot code

This invokes boot code described in the OS_BOOT.ASM file. OS_BOOT.ASM is one of the files that users must describe themselves.

(4) SPX pause at boot

This pauses processing from immediately after the OS starts until HOST preparations end. Processing does not operate until there is a pause-releasing instruction from the host. The default value is set so that processing pauses. When using a Host API, the user need not be aware of the pause status of the OS. For simulation, set this command not to be used.

(5) OS error check level

This outputs the error codes of specified system calls. By default it is set so that error codes are not output. If select a check box, the error code will be output.

(6) RTOS segment type

Specify whether to allocate RX77016 code in internal memory or external memory. By default this is set so that it is allocated in internal memory. If you want any segment to be allocated in external memory, select its check box.

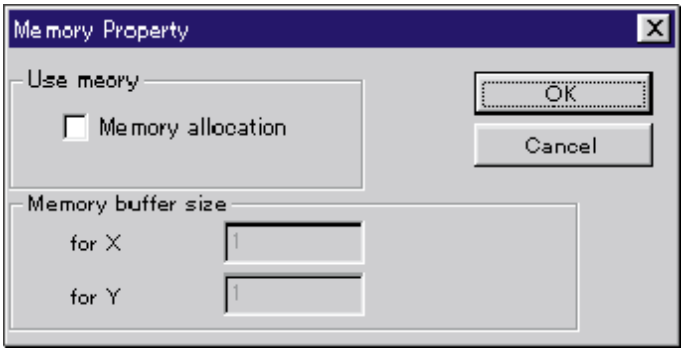
(7) ROM data for OS is located into YRAM

Select whether to make the destination for placing ROM data YROMSEG or YRAMSEG.
The default value is set so that YRAM is specified. If you wish to specify YROM, select the check box.

4.4.5 Setting Memory property

The following figure shows the Memory property setting screen.

Figure 4-10. Memory property Setting Screen



Each command is described below.

(1) Use memory

Select this check box to use the memory management function.

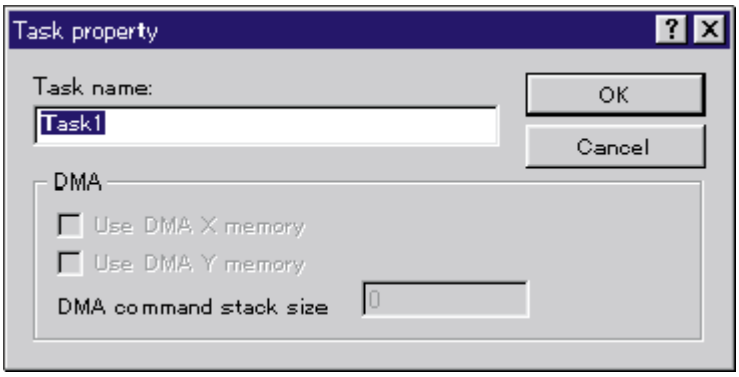
(2) Memory buffer size

Specify the sizes of the data areas for memory allocation management of X and Y memories. The default is 1 for both.

4.4.6 Setting Task property

This sets properties of a task.

Figure 4-11. Task property Setting Screen



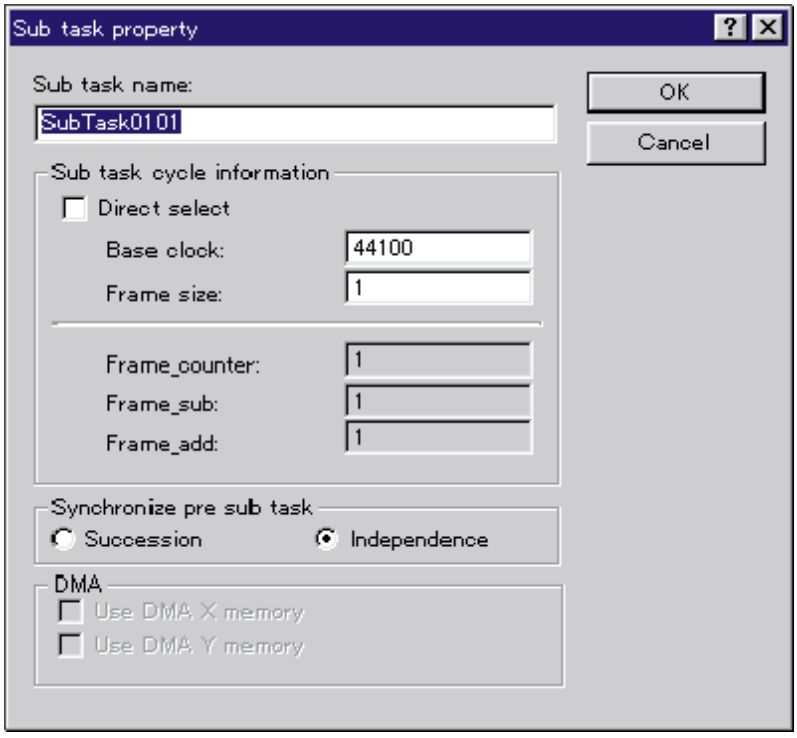
(1) Task name

This registers a task name.

4.4.7 Setting Sub task property

This sets properties of a sub task.

Figure 4-12. Sub task property Setting Screen



Each command is described below.

(1) Sub task name

This registers the name of a sub task. The names of sub tasks cannot be shared. Be sure to input separate names. In addition, since sub task names are used internally as symbols, be careful of the characters used.

(2) Sub task cycle information

If Direct select is selected, the following settings are made.

(a) Frame_counter: TimerClock*FrameSize/_FRAME_COUNTER_PERIOD

(b) Frame_sub: SamplingFreq

(c) Frame_add: TimerClock*FrameSize/_FRAME_COUNTER_PERIOD

Here, “SamplingFreq” is the sub task execution period, “TimerClock” is the clock frequency used as a timer, and “FrameSize” is the sub task frame size. In addition, _FRAME_COUNTER_PERIOD designates the timing of updating the frame counter value that was set in Task information property. If Direct select is selected, the user can change the frame counter value to a desired value. For example, it is possible to set (1,0,1) to not execute the sub task.

If Direct select is not selected, set as follows.

(d) Base clock

Set the sampling frequency of data processed in the sub task.

(e) Frame size

Set the amount of data processed at once when the sub task is executed.

(3) Synchronize pre sub task

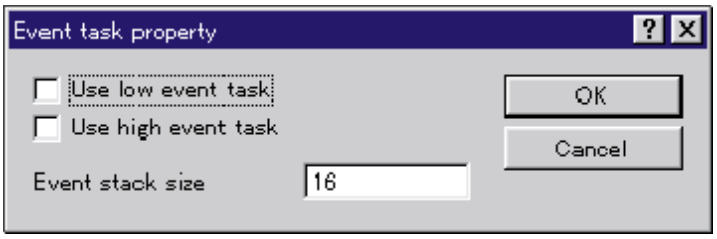
Select Succession to execute sub tasks in list order, or Independence to place no restrictions on sub tasks. The first sub task of each task is set to Top. User settings are ignored.

4.5 Setting Properties of Optional Functions

4.5.1 Setting Event task property

This sets properties of an event task.

Figure 4-13. Event task property Setting Screen



Each command is described below.

(1) Use low event task

Low priority event task management is a function that does not perform event processing immediately after an execution request is issued, but performs it after sub task execution ends or during task switching. Use this management method if it is not necessary to execute an event processing program immediately. The default value is set so that this is not used. Normally, the number of sub tasks registered is 31, but when using this function the number of sub tasks of Task1 can be no more than 30. To use it, select the check box.

(2) Use high event task

High priority event task management is a function for performing event processing immediately after an execution request is issued by instantly suspending the sub task or task currently in progress. Since task switching occurs in order to perform event processing, this management method places a burden on task scheduling. To use it, select the check box.

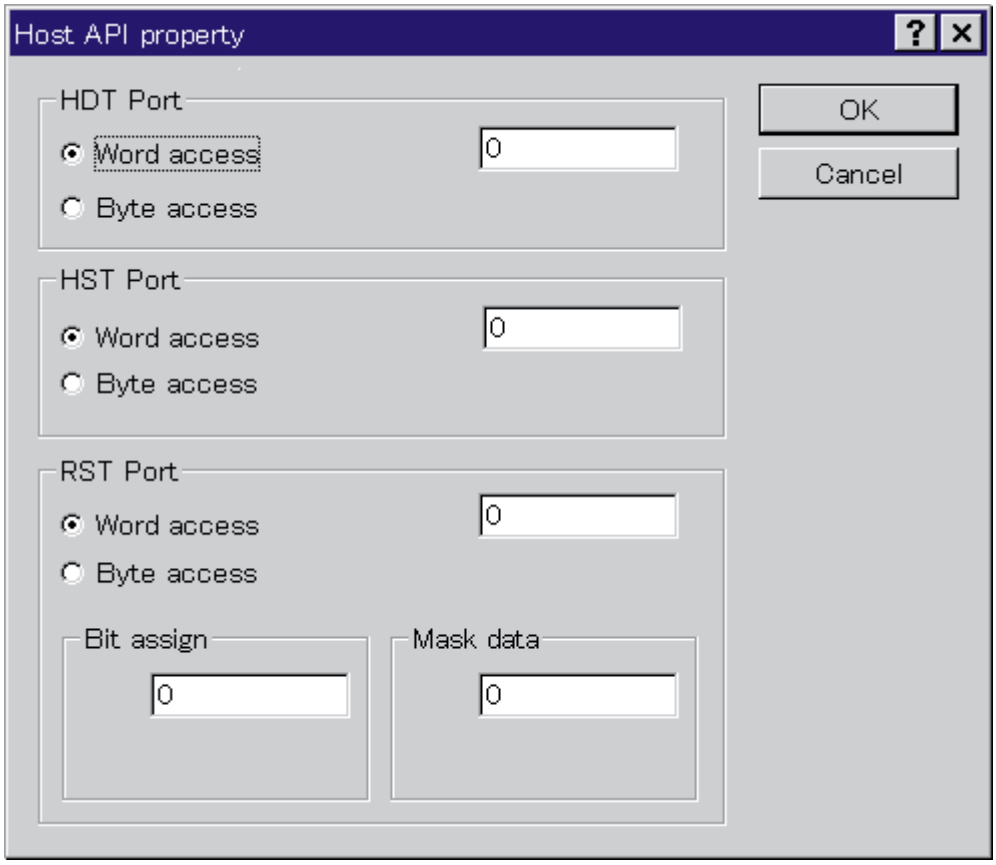
(3) Event stack size

This specifies the event ID stack size. The default value is 16. Be sure to specify a value of 2 or higher. If neither low priority event task management nor high priority event task management is specified, a stack area is not allocated.

4.5.2 Setting Host API property

This sets properties when using the Host API management function.

Figure 4-14. Host API property Setting Screen



Each command is described below.

(1) HDT Port

The host data register is a 16-bit register for input/output of data from the host interface. If word access is specified, 16 bits (1 word) of data is read or written using one I/O port.

(2) HST Port

The host interface status register (HST) is a 16-bit register that shows the mode setting and status of the host interface. Like the host data register, if word access is specified, 16 bits (1 word) of data is read or written using one I/O port.

(3) RST Port

A reset signal (RST) correctly initializes a device prior to program execution. Set whether to perform byte access or word access for the I/O port that accesses this pin.

(a) Bit assign

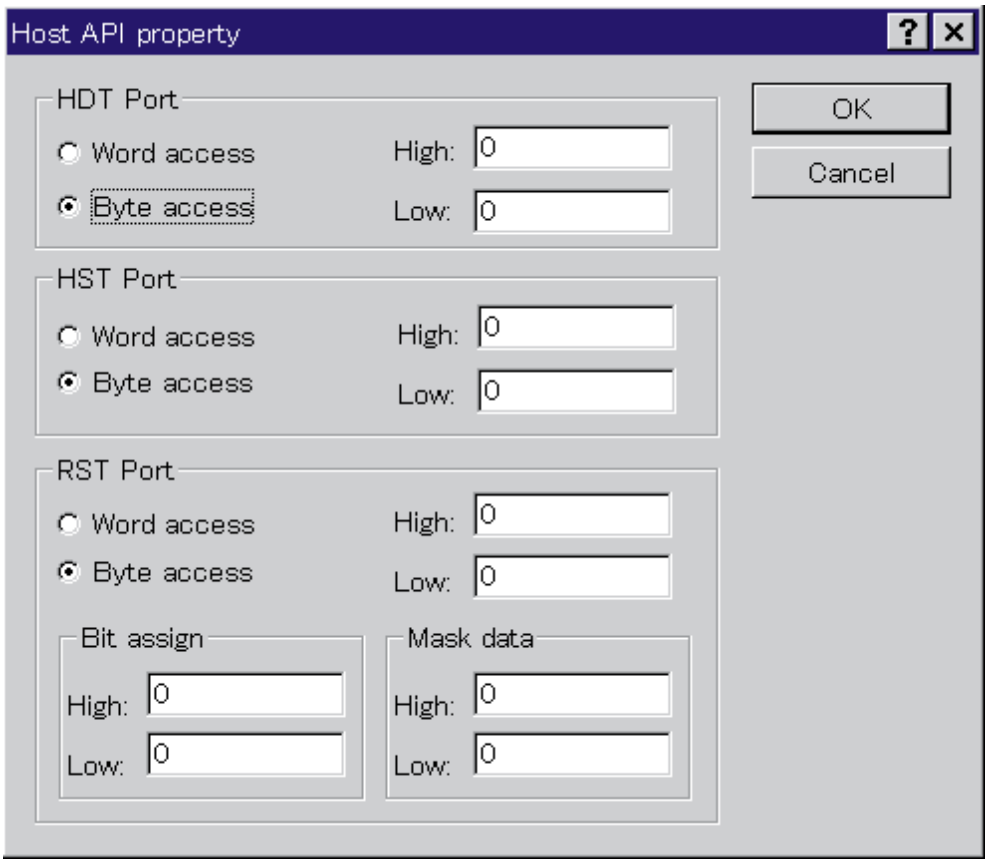
Although 16 bits of data are sent to the RST pin, the bit actually used for reset is specified here. Use up to four hexadecimal digits to specify 1 in the relevant location and 0 elsewhere.

(b) Mask data

For the I/O port that accesses the reset pin, use up to four hexadecimal digits to specify OR mask data at pins other than the reset pin (if 1 is specified in the bit position of the RST pin, mask processing is ignored).

Each command of Host API property when the byte access method is used is described below.

Figure 4-15. Host API property Setting Screen (Using Byte Access Method)



(1) HDT Port

Specify the I/O port address when performing byte access to the HDT register. Byte access divides 16 bits into higher 8 bits and lower 8 bits and reads and writes data using a different I/O port for each. Specify bits 8 to 15 of the I/O port address in High at the top of the screen and bits 0 to 7 in Low.

(2) HST Port

Specify an I/O port address in the same way as for the HDT register. Specify bits 8 to 15 of the I/O port address in High and bits 0 to 7 in Low.

(3) RST Port

Specify the I/O port address when performing byte access. Specify bits 0 to 7 in Low including the reset pin and specify bits 8 to 15 in High.

(a) Bit assign

Specify the bit position of the reset pin in the lower byte using up to two hexadecimal digits. Specify 1 in the relevant position and specify 0 elsewhere.

(b) Mask data

Specify this for the lower byte using up to two hexadecimal digits to mask data (except the RST pin) when performing byte access (if 1 is specified in the bit position of the RST pin, mask processing is ignored).

[MEMO]

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